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AUTHOR Burrill, Carol
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ABSTRACT

A review of research was conducted on the possibility of a sensitive period for the acquisition of native-like pronunciation in a second language, as well as on related questions concerning the universality of this phenomenon, age factors, biological versus cultural origins, and developmental psychology. The review showed variation in studies and findings with regard to the age groups considered, nature of the pronunciation tests, and length and type of exposure to the second language. One conclusion drawn is that cerebral lateralization is likely to be irrelevant to mastery of accent-free speech in a second language, while age is a factor. Further research on adult second language acquisition is recommended, including examination of possible post-puberty psychomotor disadvantages, adult unwillingness to take risks, and identification with in- or out-groups through language proficiency. It is inferred that there is no innate psycholinguistic factor operating to prevent learning a second language with accent-free pronunciation as an adult, and that language teachers must attend to pronunciation accuracy as they would to accuracy in other aspects of language learning. (MSE)

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THE SENSITIVE PERIOD HYPOTHESIS: A Review of Literature Regarding Acquisition of a Native-like Pronunciation in a Second Language

Carol Burrill
21 West Garfield Street
Seattle, Washington 98119
(206) 285-3676

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Introduction

A question of considerable theoretical and practical importance is whether there is a "sensitive period" for the acquisition of native-like pronunciation in a second language. Much research has been directed towards finding out whether there is really a critical period of language growth in every individual after which it is impossible to learn a second language without an accent. We can all think of people who seem to have thoroughly learned the syntactic, semantic and morphological systems of English, yet who continue to speak with a marked foreign accent. Joseph Conrad, for instance, who learned English when he was eighteen, is often pointed to as sparkling proof of the possibility of mastering a second language in adulthood. Yet, he is said to have had so strong a foreign accent that he was prevented from lecturing publicly in England (Scovel, 1969).

If there is a sensitive period for the acquisition of a non-native phonology, further questions arise as to the nature of this phenomenon. First, is it universal? Are there any persons who acquire a second language in adulthood with no accent at all? At what age do accents begin to appear? What is the reason for this sensitive period? Is it related to the biological development of the brain or the motor functions, or is it a cultural phenomenon, or tied to other maturational developments in adulthood? Finally, is the nature of this sensitive period such that it is futile to try to improve an adult's pronunciation? These are some of the issues addressed in the articles I will consider in this paper.

Justification of Study

Before beginning a review of the literature on this topic, it would be wise to consider why the acquisition of an accent-free

L2 should deserve our attention at all. Obviously, it is not necessary to completely eliminate an accent in order to effectively use a language. Traditionally, syntax, morphology, grammar, and other aspects of a second language are attended to in the classroom before pronunciation, if pronunciation is attended to at all. The problem is, however, that a faulty pronunciation subjects the L2 speaker to more subtle difficulties than an overt breakdown in communication. As Oyama (1976) points out, accented speakers must sometimes pay a serious social penalty. Their imperfect pronunciation may inhibit them, affect their social interactions and aspirations, and lead them to avoid certain situations. Until we become more enlightened in our linguistic attitudes, she claims, the problems related to accented speech are a social reality and we ignore them "at our students' peril" (p. 35).

Flege (1981) does a brief review of studies on the "onus often associated with accentedness" (p. 447). In several experiments, listeners were asked to evaluate the personality of a speaker after listening to short samples of speech. Both in a study by Anisfeld, Bogo, and Lambert (cited in Flege, 1981) and in a study by Arthur, Farrar, and Bradford (cited in Flege, 1981), the matched-guise technique was used. The same speaker produced a single speech sample twice, once accented and once with no accent. In a study by Ryan and Carranza (cited in Flege, 1981) speech samples by large numbers of native and non-native speakers were evaluated. According to Flege, such studies consistently showed that persons whose speech is accented will be rated less favorably than non-accented speakers along rating scales such as intelligent vs. stupid or kind vs. cruel. Further, the greater the degree of perceived accent, the more unfavorably a speaker will be evaluated. Unfortunately, Flege doesn't mention what languages were represented by the non-native accents. Clearly, in our culture, certain accents have more prestige than others, so the evaluation given to an accented speaker would likely depend to some degree on the language background of the speaker.

Coates and Regdon (1974) paint a particularly bleak picture of the accented speaker in the United States. Patricia Regdon has long experience working with non-native speaking company employees. She points to responsible, talented individuals who read, write and express ideas in English relatively well, yet whose professional skills and capabilities lie wasted because of a foreign accent. According to the authors, employers hesitate to promote accented speakers out of clerical positions to supervisorial or management positions. This lessens accented speakers' personal feelings of worth and constricts their ability to contribute from their cultural heritage to the benefit of ours.

Review of Literature

Probably the most controversial and most cited work related to the acquisition of a non-native phonology is Eric Lenneberg's Biological Foundations of Language (1967). In this, Lenneberg gave popularity to the idea that there are maturationally optimal periods for language acquisition. Most of his inferences are based on data from cases of aphasia, deafness, and other handicaps, and refer to acquisiton of a first language. However, he alludes to adults' ability to learn a second language with the note, "Foreign accents cannot be overcome easily after puberty" (p. 176). Further, on his "Summary Survey" of the biological development of the brain and its effects on language development (pp. 180-181), there is the note that foreign accents emerge at ages 11-14. The explanation for this phenomenon is that at this time language becomes markedly lateralized and internal organization of the brain is established irreversibly for life.

Scovel (1969) takes up the implications of Lenneberg's studies for second language acquisition and teaching. He points out that linguists and psychologists have avoided talking about the re-

lation of brain mechanisms to human behavior because the brain is outside our control. They have preferred to offer up environmental reasons for the child-adult differences in the ability to acquire an L2 without an accent. Yet, Scovel maintains, the simultaneous occurrence of brain lateralization and the appearance of foreign accents is too great a coincidence to be ignored. The same cerebral plasticity that Lenneberg claims accounts for the ability of the child's brain to relocate speech to the non-dominant hemisphere in cases of cerebral trauma must account for the plasticity of neurophysiological mechanisms underlying the production of sound patterns of an L2. This means that the inability of adults to master a language without a foreign accent after about the age of 13 is directly related to the fact that cerebral dominance has become permanent. If this is all true, Scovel concludes, our efforts as ESL teachers to rid students of a foreign accent are futile.

As Scovel points out, a biological explanation for the apparent inability of adults to master an L2 phonology is a very serious claim. It could lead to lowered expectations on the part of both second language teachers and students. Fortunately, later studies have subjected the conclusions of both Lenneberg and Scovel to critical scrutiny. The result has been a trend away from a biological explanation for the appearance of foreign accents after puberty.

Hill (1970) uses Scovel's article as a jumping-off point for suggesting lines of research in foreign accent that do not take an innatist approach. She points out that a biological explanation for foreign accents must meet strict tests of cross-cultural validity. The kind of language behavior Scovel describes must be "demonstrably universal in the species under consideration" (p. 238). She points to two societies that might yield results regarding accent-free L2 acquisition that are different

from Lenneberg's and Scovel's largely middle-class, U.S. subjects. The first society is the group of American Indians of the northwest Amazon studied by Arthur Sorenson. The Indians live in an area where there are about two dozen mutually unintelligible languages spoken. Each tribal unit, identified by the language it speaks, is exogamous; that is, people must marry individuals who do not speak the same language. The Indians live in patrilocal longhouses, and in each longhouse several languages are spoken. Children, then, are bi- or trilingual before adolescence. They know their own father-tongue, their mother's father-tongue, and the lingua franca of the area, which is learned from visitors. During adolescence, individuals begin speaking the two or three other languages of their longhouse or to which they have been exposed in travel. In adulthood, they may acquire more languages, then work to perfect their knowledge of all those languages into old age. Further, Sorenson notes that the diverse phonologies of the various languages "loom very prominently in the Indians' regard" (p. 241). Hill's second reference is to the Siane of Papua New Guinea, studied by Richard Salisbury. Here, adult males commonly acquire new languages because of the role multilingualism has in politics. When a speech is made in a language not familiar to everyone, it is translated. To have one's remarks translated by another brings a special importance to a man's speech and draws attention to it. Salisbury notes that the men who are the most successful in acquiring unfamiliar languages become the most powerful in the society.

The drawbacks to the studies noted by Hill, as she herself admits, is that they don't directly address the points raised by Scovel. They don't indicate whether the adults are as good as the children in acquiring second languages. Nevertheless, they do give enough information to suggest that studies of these kinds of societies may yield differing results from the language acquisition situations seen in adult learners in the largely

monolingual U.S. speech communities. She concludes that Scovel's assertion that few adults ever rid themselves completely of a foreign accent has been inappropriately taken to be a universal situation. Studies of multilingual speech communities of various types may show that this factor does not in fact operate. Then we will have to look at the other maturational developments that occur at puberty as an alternative to the cerebral dominance explanation for adult foreign accents.

The question as to whether Lenneberg's critical period constraint holds in different cultural environments is not taken up until a 1975 study by Seliger, Krashen, and Ladefoged. Previous to that study, investigations of the question were limited to fairly small groups of immigrants to the U.S. with similar linguistic backgrounds. Oyama (1976, study completed in 1973) looked at a group of 59 Italian-born male immigrants in New York and found a direct correspondence between age of arrival in the U.S. and degree of foreign accent. Asher and Garcia (1969) found the same thing for 71 Cuban immigrants living in the San Francisco area. The results in both studies were based on native speakers' judgments of degree of accent upon listening to tape recordings of the subjects.

The Seliger et al. study was a survey carried out as a class assignment at UCLA, Queens College, Bar Ilan University, and Tel Aviv University. Each student was to interview three adult immigrants: one who arrived before puberty, one who arrived at around puberty, and one who arrived after puberty. The questionnaire included items such as, "Do you think many ordinary Americans (Israelis) could tell now that you are not a native speaker of English (Hebrew)?" and, "If the answer to the last question is 'no,' how old were you when you became indistinguishable from a native speaker? in other words, it took you ___ years to lose your foreign accent?" The survey covered 394

adults in the U.S. and Israel representing 28 L1's. Responses were divided into three groups: those who arrived at age 9 or younger, 16 or older, and between 10 and 15. In the first two groups, there was no significant difference between Hebrew and English learners. In the 10-15 age group, there tended to be more Hebrew leaners who reported no accent. However, there were significant differences when statistics were combined for Hebrew and English learners and age was examined. Subjects 9 and under at the time ofimmigration generally retained no foreign accent, subjects 10-15 gave mixed responses as to the presence or absence of an accent, and subjects 16 or older generally retained an accent. The results led the authors to conclude that puberty may in fact be an important turning point in language learning ability and that their cross-cultural study confirms Lenneberg's critical period. However, they point out that the basis for this critical period is not necessarily the development of cerebral dominance. They also point out the existence of two small classes of exceptions: 12 of the 156 adult learners reported no accent while 7 of the 121 pre-puberty learners reported accents.

The Seliger et al. study doesn't deal with a culture as removed from Western norms as Jane Hill would have wished, for a comparison with the U.S. Intercultural differences, perhaps, are not to be expected in societies as similar as the U.S. and Israel. Another drawback to the study is that it is based on a self-rating of accent. The authors justify this technique of data-gathering by pointing to the fact that their results are consistent with those of previous studies. They found a direct correlation between the age of arrival in a foreign country and the degree of accent retained as an adult, as did Oyama and Asher et al. This is not a particularly compelling argument for their use of this questionable data-gathering technique.

Although an objective rating of accent on 394 subjects is admittedly a big task, the survey would thereby have had a good deal more value.

Another often-cited work in the literature on acquisition of a native-like phonology in an L2 is the study by Snow and Hoefnagel-Hohle (1977) involving data from both laboratory and naturalistic settings. The authors maintain that a stringent test of the critical period hypothesis involves comparing the speed of acquisition of correct L2 pronunciation in different age groups. Therefore, they tested 36 speakers of British English ranging in age from 5 years to adult in the ability to imitate unfamiliar Dutch words. Each of five Dutch words was presented 20 times, and each subject was asked to repeat it after each hearing. Responses were taped and certain target sounds were later judged by three native Dutch speakers on a scale of 1-5, 1 being uninterpretable as target sound and 5 being indistinguishable from a native speaker. The authors found that the two youngest groups (ages 5 and 6) showed the lowest scores and the two oldest groups (aged 17 and adult: 21-31 years) showed the highest. When ages were pooled into 5 groups--5-7, 8-10, 11-13, 15-17, and 17-31 years--the increase in score with age was linear. In examing improvement from the first 10 trials of the target word to the second 10 trials, the authors found approximately equal improvement for all age groups. Thus, the older group showed better performance than the younger group from the very beginning.

The naturalistic study was designed quite differently. 47 English speakers aged 3-60 who were learning Dutch while in Holland were followed during their first year of L2 acquisition. A pronunciation test was administered three times during the year. The test involved 80 simple, familiar Dutch words that were produced once following a native speaker's model and once

spontaneously, in response to a picture. The items were scored on the same five-point scale as before, but with a single judge. The authors found that at the time of the first test, the scores on spontaneous production increased linearly with age while in the other case, the different age groups were equally good at pronunciation. By the third test (after 10 to 11 months' learning), the younger subjects had become better at pronouncing some sounds and the older subjects had lost their initial advantage. The authors conclude from these two tests that youth confers no immediate advantage in learning to pronounce foreign sounds. In the short term, older subjects were significantly better than the younger subjects at pronunciation. Only after about a year did the younger subjects begin to excel. In terms of ultimately achieving near-native pronunciation, the authors found that ages 3-15 seemed to be optimal. None of these results, the authors point out, accord with any neurologically determined critical period.

One of the problems with this study is that it evaluates pronunciation on the basis of isolated words, or, in the case of the laboratory study, isolated phonemes only. However, perception of a foreign accent is not based just on overtly detectable mispronunciations of sound segments. Listeners are likely to base a judgment of foreign accent on some combination of segmental, subsegmental and suprasegmental differences which distinguish the speech of a native from that of a non-native speaker. In fact, Coates and Regdon (1974) maintain that errors in intonation and stress cause incomprehensibility in the L2 speaker more often than errors in individual phoneme pronunciation. Another problem with both tests in this study is that most of the results are based on subjects' immediate imitation of a native speaker model. Mimicry may be a skill that is entirely

separate from the ability to perceive and acquire a non-native phonological system. In a 1978 study by Neufeld (cited in Neufeld, 1980), subjects were asked to imitate sound sequences in an unfamiliar non-Indo-European language. Neufeld reports Krashen's suggestion that these subjects may have been processing phonetic material in the right or non-dominant hemisphere since the task was non-linguistic in nature. As with Snow and Hoefnagle-Hohle's laboratory study, the subjects in Neufeld's study were not given the meaning of the target utterances. The aim was to see if they could mimic the sounds of languages they had never heard before. This kind of linguistic task may call on cerebral processing abilities that are completely separate from those called for in acquiring an L2 phonology.

Schnitzer, in a 1978 review, takes a step back from the articles that examine the implications of the critical period hypothesis. He returns to an examination of the kind of literature that gave rise to the hypothesis in the first place. He first reviews the literature on which Lenneberg primarily based his conclusions regarding age of lateralization--a study of 102 hemiplegia cases by L. Basser. Schnitzer found that all cases of right hemisphere damage leading to speech problems occurred before age five rather than 11, as indicated by Lenneberg. This indicates that cerebral dominance in fact occurs before age five. Shnitzer also points out dichotic listening experiments performed by Harshman and Krashen that indicate lateralization is probably complete by age four. According to Lenneberg's and Scovel's sensitive period hypothesis, right-ear superiority should increase until puberty on dichotically presented language tasks. Harshman and Krashen found that from ages four to nine, there was no significant change in degree of lateralization as shown through right ear advantage, and that the degree of lateralization shown in this age group was the same as adults

under similar test conditions. Other studies performed by Molfese, Freeman, and Palermo present evidence that language is lateralized from birth. They studied groups of infants, children, and adults by placing electrodes on both hemispheres and presenting speech and non-speech stimuli. No subject responded to stimuli equally in both hemispheres. Most subjects responded in the left hemisphere for speech and in the right for non-speech, including a week-old infant. Further, Schnitzer points out an anatomical study by Geschwind and Levitsky that reports prenatal hemispheric asymmetry between the left and right hemispheres. This seems to indicate that language may be lateralized from before birth. Schnitzer reconciles these various findings by suggesting that although the brain is lateralized for language from before birth, it is plastic for the first five years. This is why language function is transferred almost perfectly from the left to right hemisphere by trauma victims who are younger than five. As for the phenomenon of foreign accents, it cannot, according to Schnitzer, be related to either lateralization or plasticity since these periods end long before puberty. He suggests looking to other maturational developments that occur at puberty as reasons for the advent of foreign accents.

Neufeld, in a 1980 article, reviews several studies he has made related to the sensitive period hypothesis. The first addresses the question as to whether there are any exceptions to the sensitive period hypothesis. Previous studies show a small minority of adult learners who seem to have attained a native-like pronunciation in their L2. Yet Neufeld reports Scovel's argument that there is no hard data on these exceptional cases, that these exceptions occur simply on the basis of subjective impressions of researchers. To obtain some clear data, then, Neufeld selected seven non-native subjects who seemed to pass as native speakers of French although they had learned French as adults. These subjects, along with three native-

speaking controls, recorded a set passage which contained sounds known to be especially difficult for English-speaking students. 85 native-speaking judges were asked to assess each speaker as 1) Francophone du Canada, 2) Francophone d'un autre pays, or 3) Non-francophone. Five of the seven non-native informants were consistently evaluated as francophone. Neufeld concluded that his findings showed that some adults can and do acquire native-like proficiency at the phonological level in L2. Therefore, the version of the sensitive period hypothesis which admitted no exceptions must be rejected.

During the preparation of the study described above, Neufeld noticed a significant difference between the perceptive and productive abilities of several English-French bilinguals who had evaluated the test instruments. Even though these bilinguals spoke French with an English accent, they seemed to match the perceptive abilities of native-speaking francophones in recognizing foreign accents. Neufeld prepared two tests to follow up on this phenomenon. As before, Neufeld had highly proficient L2 French speakers and native controls record a set passage in French. English-speaking subjects were asked to rate each of the French speakers as belonging to one of the three categories used in the previous test. Then, the subjects were given a printed copy of the corpus they had just heard and were asked to read it aloud onto a tape recorder. These recordings were used to compare the subjects' receptive and productive performances. In the first version of the test, all 54 subjects were highly proficient in French, had acquired French as adults, and spoke French with a clear foreign accent. The second version used 24 subjects who had only an elementary knowledge of French, but who also had studied French as adults and who had marked accents. Neufeld found that for the advanced L2 learners, there was significant asymmetry in adults' receptive and productive performance in L2

at the phonological level. Students who acquired an L2 as adults didn't appear to have any handicap with regard to speech perception. Furthermore, the advanced speakers of French as an L2 did significantly better than the elementary speakers in detecting accents. Neufeld maintains that this indicates the subjects were not simply utilizing their English phonology as their criteria in a search for English-like sounds. A knowledge of phonological rules and representations in the L2 was required for detection of a foreign accent. These results lead Neufeld to conclude that if there is any disadvantage adults have in acquiring an L2 phonology, it must be psychomotor rather than psycholinguistic in nature. In other words, although adults may know what the L2 should sound like, many find it difficult to get their vocal apparatus into the correct positions for the appropriate sounds.

Neufeld's first experiment, which attempted to provide hard data on exceptions to the critical period hypothesis, would have been more convincing had he confined the test to Canadian French. He doesn't state whether the 10 tape-recorded informants or the 85 judges were all Canadian French speakers, or whether some were speakers of another dialect of French. A non-native French speaker who had acquired his L2 in, say, the south of France might more likely be assessed as "Francophone d'un autre pays" simply because a Canadian judge may not be familiar enough with that regional variety of French to detect phonologial variation. This would especially be true if the non-native speaker gave an otherwise fluent and natural reading of a French passage, as these informants presumably did. A more valuable version of this test would have used informants who had learned Canadian French as adults, Canadian French judges, and assessments confined to either 1) Francophone du Canada or 2) Non-francophone.

A study by Tahta, Wood, and Loewenthal (1981) examined the factors of sex, language spoken at home, years of residence in the L2 country, musical ability, L2 models, present age, number of languages now spoken, as well as age at time of L2 acquisition as predictors of successful acquisition of an L2 phonology. Their subjects were 109 immigrants to the U.K. from a variety of language backgrounds, whose acquisition of English had begun at ages ranging from 6 to 15 and older. Subjects were asked to read a paragraph of English into a tape-recorder. They were then interviewed about their history of English learning and information regarding the factors mentioned above. Three native English-speaking judges scored each recording for degree of foreign accent. The authors found only one factor to emerge strongly as a predictor of an accent-free L2: age at time of acquisition of English. If L2 learning commenced by age 6 or 7, there was no accent. From 7-9 there was almost no trace of accent. From 9-11 the chance of an accent-free L2 dropped to about 50%. From 12 or 13 on, the chances of an accent-free L2 was minimal.

The interesting thing about the Tahta et al. study is the early age at which accents become evident. Lenneberg states that accents begin appearing at the time of lateralization of brain functions, from ages 11-14. Yet, the present study indicates a significant appearance of accent beginning at age 9. The authors' explanation for this finding has widespread implications: The British judges in this study may tolerate a far smaller range of phonological variation before assessing a speech sample as accented. The authors point out that there is a much lower percentage of non-English speaking immigrants in the U.K. than in the U.S. They also suggest that there is a widely-accepted norm in the U.K. that the <u>only</u> accent-free English is the "B.B.C. English." Any variation is heard as accented. The U.S. may be more tolerant in regard to phonological variations. The question

of accent tolerance is one that has application to many of the studies examined in this paper. Often native-speaking judges are used to assess the existence of foreign accent in subjects' speech. Yet, no study to my knowledge has offered criteria to guide judges' assessment of an accent and no study has mentioned any kind of "ear training" for judges in perception of accent. The judgment of foreign accent remains entirely subjective, and is likely subject to individual and cultural variation.

Conclusions

The studies to date that investigate the critical period notion for acquisition of an L2 phonology vary greatly with regard to age groups considered, nature of the pronunciation tests, and length and type of exposure to L2. For this reason, and for the weaknesses in many of the individual studies themselves as noted above, it is difficult to draw clear conclusions. One valuable conclusion that may be drawn, however, is that it now seems likely that cerebral lateralization is irrelevant to mastery of an accent-free L2. Most studies agree that the chances of acquiring a native-like L2 pronunciation drop drastically somewhere around puberty. Yet, neurolinguistic studies done before and since Lenneberg's landmark book indicate that cerebral dominance is established long before puberty. This being the case, we can disregard Scovel's assertion that because of innate biological reasons, it is futile to try to improve our adult ESL students' pronunciation.

Studies such as those done by Seliger et al. and Neufeld indicate there may be persons who acquire an accent-free L2 at the phonological level as adults. Stringent tests should be done to clearly extablish the existence of "exceptions." Perhaps examination of these exceptions will help clarify how and why puberty seems to have the effect it does on language learning. Neufeld's hypothesis that faulty pronunciation may be due to a post-puberty psychomotor disadvantage also deserves further

attention.

As Hill and Schnitzer indicate, many maturational developments occur with puberty. We all are aware of the increased self-consciousness and loss of willingness to take risks that go along with becoming an adult. This may account for an apparent loss in ability to adopt a foreign phonology. Guiora (1972) points out that accurate pronunciation of an L2 requires modifying a basic method of self-identification. This kind of modification may not be as possible for an adult as for a child. Stevick (1976) further points out that listeners (including ourselves) from our in-group may feel threatened at the level of identity when we are too successful in our acquisition of a foreign pronunciation. Therefore, a speaker may feel social pressures to develop only a gross kind of accuracy in foreign pronunciation, to avoid identifying too closely with an out-group.

Unfortunately, it is difficult to envision an experiment that could accurately determine the effect of cultural, social, and personal factors on the acquisition of an accurate L2 pronunciation. Nevertheless, it seems clear that there is no innate psycholinguistic factor operating to prevent learning an L2 as an adult with an accent-free pronunciation. Language teachers, then, owe it to their adult students to attend to pronunciation accuracy as they attend to the other aspects of the L2. With the absence of hard data indicating that accent improvement work in adults is futile, and with the knowledge of the social handicap that may be suffered by accented speakers, language teachers do their students a disservice in neglecting faulty pronunciation.

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